CLAIMS

Claim 1 An optical information recording method, comprising, irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities,

wherein the recording power is controlled so as to satisfy (Pp1/Ppth1) < (Pp2/Ppth2), where Ppth1 is the threshold value of the recording power at which the quality of a reproduction signal drops under a specific value when a test signal is recorded at a first linear velocity v1 with the erasure power fixed and the recording power varied, Ppth2 is the threshold value of the recording power at which the quality of the reproduction signal drops under a specific value when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power fixed and the recording power varied, Pp1 is the recording power when the information is recorded at the first linear velocity v1, and Pp2 is the recording power when the information is recorded at the second linear velocity v2.

Claim 2 The optical information recording method according to Claim 1, wherein the criterion for the quality of the reproduction signal is the jitter of the reproduction signal.

Claim 3 The optical information recording method according to Claim 1, wherein the criterion for the quality of the reproduction signal is a value based on the error rate of the reproduction signal.

Claim 4 The optical information recording method according to Claim 1, wherein the criterion for the quality of the reproduction signal is a value based on the degree of modulation of the reproduction signal.

Claim 5 An optical information recording method comprising, irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels

including at least a recording power and erasure power, and recording information at two different linear velocities,

wherein the recording power is controlled so as to satisfy (Pp1/Ppth1) < (Pp2/Ppth2), where Ppth1 is the threshold value of the recording power at which the quality of a reproduction signal drops under a specific value when a test signal is recorded at a first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant, Ppth2 is the threshold value of the recording power at which the quality of the reproduction signal drops under a specific value when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant, Pp1 is the recording power when the information is recorded at the first linear velocity v1, and Pp2 is the recording power when the information is recorded at the second linear velocity v2.

Claim 6 An optical information recording method comprising, irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities,

wherein the recording power is controlled so as to satisfy a1 < a2, where a1 is the asymmetry of the reproduction signal when a test signal is recorded at a first linear velocity v1, with the erasure power fixed and the recording power varied, and a2 is the asymmetry of the reproduction signal when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power fixed and the recording power varied.

Claim 7 An optical information recording method comprising, irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities,

wherein the recording power is controlled so as to satisfy a1 < a2, where a1 is the asymmetry of the reproduction signal when a test signal is recorded at a first linear velocity v1, with the erasure

power and the recording power varied such that the ratio between these powers is constant, and a2 is the asymmetry of the reproduction signal when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant.

Claim 8 The optical information recording method according to any of Claims 1 to 7, wherein the recording system is a CAV recording system.

Claim 9 The optical information recording method according to any of Claims 1 to 8, wherein the recording power is controlled so that Pp is increased according to the increase in a linear velocity v when Pp is the recording power at the linear velocity v, which is a value between the first linear velocity v1 and the second linear velocity v2.

Claim 10 The optical information recording method according to any of Claims 1 to 9, wherein the power level between recording pulses is controlled to be different from the erasure power.

Claim 11 The optical information recording method according to any of Claims 1 to 10, wherein the power coefficient between recording pulses at the second linear velocity v2 is controlled to be higher than the power coefficient between recording pulses at the first linear velocity v1 when the power coefficient between recording pulses is α and $\alpha = (Pbtm - Pb)/(Pp - Pb)$, where Pp is the recording power, Pb is the erasure power, and Pbtm is the power level between recording pulses.

Claim 12 An optical information recording medium with which information is recorded by the method according to any of Claims 1 to 5,

wherein information expressing the value of Pp1/Ppth1 and Pp2/Ppth2 is recorded.

Claim 13 An optical information recording medium with which information is recorded by the method according to any of Claims 1 to 5,

wherein information expressing the value of Pp1 and Pp2 is recorded.

Claim 14 An optical information recording medium with which information is recorded by the method according to Claim 6 or 7,

wherein information expressing the value of a1 and a2 is recorded.

Claim 15 The optical information recording medium according to any of Claims 12 to 14, wherein the recording film is composed of a phase changing material, and

the phase changing material contains germanium and tellurium, and also contains either tin or bismuth.

Claim 16 The optical information recording medium according to any of Claims 12 to 15, having a track divided into a plurality of sectors,

having embossed tracks between the sectors, and

the tracks being formed such that the center of the embossed tracks is shifted from the center of the recording tracks of the sectors.

Claim 17 An optical information recording apparatus, for irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities, comprising:

a linear velocity setting circuit for setting two different linear velocities;

a recording pulse generation circuit for generating the recording pulses or the recording pulse train according to the setting result of the linear velocity setting circuit;

a laser drive circuit for irradiating with the laser beam at the plurality of power levels on the basis of the recording pulse train; and

a quality detecting circuit for detecting the quality of a reproduction signal,

wherein the laser drive circuit controls the recording power so as to satisfy $(Pp1/Ppth1) < (Pp2/Ppth2)$, where Ppth1 is the threshold value of the recording power at which the quality of a reproduction signal drops under a specific value when a test signal is recorded at a first linear velocity v1 with the erasure power fixed and the recording power varied, Ppth2 is the threshold value of the recording power at which the quality of the reproduction signal drops under a specific value when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power fixed and the recording power varied, Pp1 is the recording power when the information is recorded at the first linear velocity v1, and Pp2 is the recording power when the information is recorded at the second linear velocity v2.

Claim 18 The optical information recording apparatus according to Claim 17, wherein the quality detecting circuit is a jitter detecting circuit that detects jitter in a reproduction signal.

Claim 19 The optical information recording apparatus according to Claim 17, wherein the quality detecting circuit is an error rate detecting circuit that detects the error rate of a reproduction signal.

Claim 20 The optical information recording apparatus according to Claim 17, wherein the quality detecting circuit is a modulation detecting circuit that detects the degree of modulation in a reproduction signal.

Claim 21 An optical information recording apparatus for irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities, comprising:

a linear velocity setting circuit for setting two different linear velocities;

a recording pulse generation circuit for generating the recording pulses or the recording pulse train according to the setting result of the linear velocity setting circuit;

a laser drive circuit for irradiating with the laser beam at the plurality of power levels on the basis of the recording pulse train; and

a quality detecting circuit for detecting the quality of a reproduction signal,

wherein the laser drive circuit controls the recording power so as to satisfy $(Pp1/Ppth1) < (Pp2/Ppth2)$, where Ppth1 is the threshold value of the recording power at which the quality of a reproduction signal drops under a specific value when a test signal is recorded at a first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant, Ppth2 is the threshold value of the recording power at which the quality of the reproduction signal drops under a specific value when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant, Pp1 is the recording power when the information is

recorded at the first linear velocity v1, and Pp2 is the recording power when the information is recorded at the second linear velocity v2.

Claim 22 An optical information recording apparatus for irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities, comprising:

a linear velocity setting circuit for setting two different linear velocities;

a recording pulse generation circuit for generating the recording pulses or the recording pulse train according to the setting result of the linear velocity setting circuit;

a laser drive circuit for irradiating with the laser beam at the plurality of power levels on the basis of the recording pulse train; and

a quality detecting circuit for detecting the quality of a reproduction signal,

wherein the laser drive circuit controls the recording power so as to satisfy $a1 < a2$, where a1 is the asymmetry of the reproduction signal when a test signal is recorded at a first linear velocity v1, with the erasure power fixed and the recording power varied, and a2 is the asymmetry of the reproduction signal when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power fixed and the recording power varied.

Claim 23 An optical information recording apparatus for irradiating an optical information recording medium with a laser beam, forming marks or spaces so that the optical characteristics of a recording film are varied, forming the marks by recording pulses or a recording pulse train in which the power of the laser beam is switched between a plurality of power levels including at least a recording power and erasure power, and recording information at two different linear velocities, comprising:

a linear velocity setting circuit for setting two different linear velocities;

a recording pulse generation circuit for generating the recording pulses or the recording pulse train according to the setting result of the linear velocity setting circuit;

a laser drive circuit for irradiating with the laser beam at the plurality of power levels on the basis of the recording pulse train; and

a quality detecting circuit for detecting the quality of a reproduction signal,

wherein the laser drive circuit controls the recording power so as to satisfy a1 < a2, where a1 is the asymmetry of the reproduction signal when a test signal is recorded at a first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant, and a2 is the asymmetry of the reproduction signal when the test signal is recorded at a second linear velocity v2 that is higher than the first linear velocity v1, with the erasure power and the recording power varied such that the ratio between these powers is constant.

Claim 24 The optical information recording apparatus according to any of Claims 17 to 23, wherein the recording system is a CAV recording system.

Claim 25 The optical information recording apparatus according to any of Claims 17 to 24, wherein the recording power is controlled so that Pp is increased according to the increase in a linear velocity v when Pp is the recording power at the linear velocity v, which is a value between the first linear velocity v1 and the second linear velocity v2.

Claim 26 The optical information recording apparatus according to any of Claims 17 to 25, wherein the power level between recording pulses is controlled to be different from the erasure power.

Claim 27 The optical information recording apparatus according to any of Claims 17 to 26, wherein the power coefficient between recording pulses at the second linear velocity v2 is controlled to be higher than the power coefficient between recording pulses at the first linear velocity v1 when the power coefficient between recording pulses is α and $\alpha = (Pbtm - Pb)/(Pp - Pb)$, where Pp is the recording power, Pb is the erasure power, and Pbtm is the power level between recording pulses.